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10/527969

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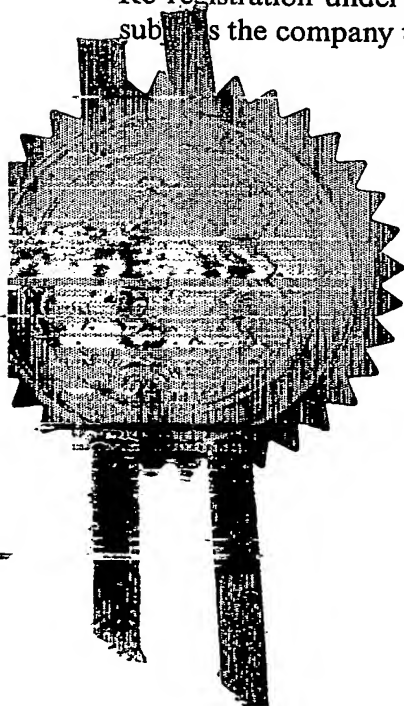
PCT

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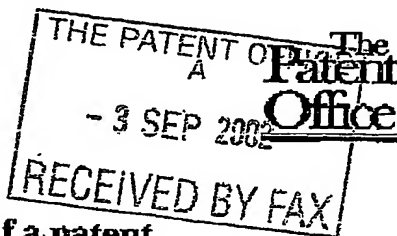
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Patents Act 1977  
(Rule 16)03SEP02 E745474-2 002835  
P01/7700 0.00-0220445.1

## Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road  
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NP9 1RF

1. Your reference

WMO/JAW/P200354

2. Patent application number

(The Patent Office will fill in this part)

0220445.1

- 3 SEP 2002

3. Full name, address and postcode of the or of each applicant (underline all surnames)Lee, Paul Bernard  
P O Box 30576  
Dubai  
United Arab Emirates

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

6026991002

4. Title of the invention

Dart-operated big bore by-pass tool

5. Name of your agent (if you have one)

Urquhart-Dykes &amp; Lord

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Tower House  
Merrion Way  
Leeds  
LS2 8PA

Patents ADP number (if you know it)

1644004

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

No

a) any applicant named in part 3 is not an inventor, or

b) there is an inventor who is not named as an applicant, or

c) any named applicant is a corporate body.

See note (2))

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Continuation sheets of this form

Description 4 ✓

Claim(s)

Abstract

Drawing(s) 2 only ✓

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date

Waghmare-Dykes & Lord 3.9.02

12. Name and daytime telephone number of person to contact in the United Kingdom

W M Orr - 0113 2452388

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## DART-OPERATED BIG BORE BY-PASS TOOL

This invention relates to a dart-operated big bore by-pass tool for use in a drill string.

Some drilling operators require a circulation tool with a large through-bore to allow for retrieval of MWD probes and nuclear sources, but this can cause difficulties when there is a requirement, which arises from time to time during drilling, to by-pass the flow of fluids in the drillstring by directing the fluids through one or more by-pass port.

It is already known from US 4889199 and 5499687 to provide a by-pass tool which has an axially displaceable sleeve which is spring-loaded to an inactive position in which it blocks communication between the interior of a drillstring and one or more by-pass port (so as to allow normal flow of fluids lengthwise of the drillstring). However, a valve seat is provided which is arranged to receive a deformable activation ball (launched from the surface and travelling down the drillstring), and which then creates a pressure build-up resulting in the valve seat and the sleeve moving downwardly so as to uncover the by-pass port and allow by-pass flow of fluids. The tool therefore can be ball-activated so as to take-up an active by-pass mode.

When it is required to re-set the tool, a smaller hard ball is launched from the surface and which forces a larger and deformable activation ball through the valve seat so that the sleeve then returns to its original position (covering the by-pass port).

The present invention addresses the problem of how to provide a by-pass tool which can work in a large or big bore system to permit retrieval of objects down hole, but which can divert the flow of drillstring fluids through a by-pass port when required.

According to the invention there is provided a by-pass tool for incorporation in a drillstring to provide a large bore throughflow passage for drillstring fluids and to permit retrieval of large objects down hole, when the tool is in an inactive mode, and in which the tool is capable of being activated, upon launching of an activation dart from the surface, to an active mode in which drillstring fluids can be diverted to a by-pass port, and in which the tool comprises:

a by-pass port; and

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an axially displaceable member which can cause blocking or release of access from the interior of the tool to the by-pass port, said member being displaceable upon launch of the activation dart so as to release access to the by-pass port:

in which the tool is capable of reverting to its inactive mode by wireline retrieval of the dart.

Therefore, during operation of a preferred embodiment of the invention, a circulation tool with a large throughbore is provided for retrieval of objects down hole, such as MWD probes and nuclear sources.

Activation of the tool is achieved by dropping a retrievable dart. Re-setting the tool is achieved by retrieving the dart, down hole or on the surface. A unique latch mechanism is provided which can be set-up to release, or activate, at the desired pressure of the operator. The tool can be arranged to re-set with 200lb of pulling force on the dart.

The tool is useful to operators by allowing an operator to pump any pumpable material, or achieve maximum flow rates at any time by dropping the dart. To resume drilling, it is simply necessary to use a rig wireline to retrieve the dart and then cause re-setting of the downhole tool.

The tool is also very useful for tripping so-called "dry pipe". With the dart dropped, and the tool activated to an open condition, pull out from the hole can result in the drillstring draining through the ports. When the tool reaches the surface, the connection of the top of the tool to the drillstring can be broken, and easy removal of the dart can be accomplished, resulting in re-setting of the tool. This is a simple and fast procedure. Rocking back of the tool simply re-sets it.

A preferred embodiment of dart operated big bore by-pass tool according to the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side view, partly in section, of a by-pass tool according to the invention incorporated in a drillstring and with the tool taking-up an inactive mode suitable for drilling and providing a large through bore;

Figure 2 is a similar view of the tool, but after activation to an active by-pass mode;

Figure 3 shows the tool upon initial engagement with the tool of a surface launched activation dart; and,

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Figures 3 and 4 show in detail the interaction between the activation dart and the tool components, respectively, during (a) dart launch to activate the tool and (b) dart retrieval to re-set the tool.

Referring to the drawings, a by-pass tool according to the invention is designated generally by reference 10 and is incorporated in a drillstring, and provides a large through bore or passage of drillstring fluids, and also to allow retrieval of large objects down hole, such as MWD probes and nuclear sources.

The tool is shown in Figure 1 in an inactive mode, and in Figure 2 is shown in an activated position after launch of an activation dart 11. The tool has a by-pass port, and an axially displaceable member is provided in the tool which can cause blocking or release of access from the interior of the tool to the by-pass port, the member being displaced following launch of the activation dart so as to release access to the by-pass port.

The tool is also capable of reverting to its inactive mode by wireline retrieval of the dart, or upon removal of the dart after the tool has been returned to the surface.

Figure 3 shows the dart 11 making initial engagement with the tool, following launch from the surface. Figures 4 and 5 show, to an enlarged scale and in detail, the interengagement between the dart, during launching to activate the tool, and upon subsequent retrieval of the dart to initiate re-setting of the tool.

Referring in particular now to Figures 4 and 5, there is disclosed a unique latch system, as well as a unique positive reset system, which are simple mechanical arrangements which make the big bore system effective and reliable.

During normal drilling, the mandrel is locked in place, and a collet 20 is held between a spring retainer 21 and a top sub sleeve 22. When dart 11 is launched, force is applied to the collet 20, pulling down on the spring retainer 21, compressing its spring 23, until the travel overcomes or moves beyond the top sub sleeve 22, thereby releasing the collet 20 and opening the by-pass ports.

The tool is simple to reset, because when the tool activates, the diameter of the collet 21 reduces. When the dart is retrieved, by wireline, it is pulled up the collet 20 until it contacts a profile 24 on the top of the dart 11, and a profile 25 on the collet 20. Continued pulling on the dart will pull the collet 20 up until it contacts the top sub sleeve 22. The spring pre-loading the top sub sleeve 22 is weak e.g. 200lb, and the dart will pull the collet 20, compressing the top sub sleeve 22 until the collet is free to reset. When the

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collet resets, the top sub sleeve 22 springs down, locking the collet 20 in position. The collet diameter opens, allowing the dart to be pulled to the surface.

It will be noted from Figures 4 and 5 that there is inline engagement between the lower end of top sub sleeve 22, and the upper end of collet 20, by way of sliding wedge faces, whereas Figure 5 shows laterally outward deformation of the upper end of the collet 20 relative to the top sub sleeve 22.

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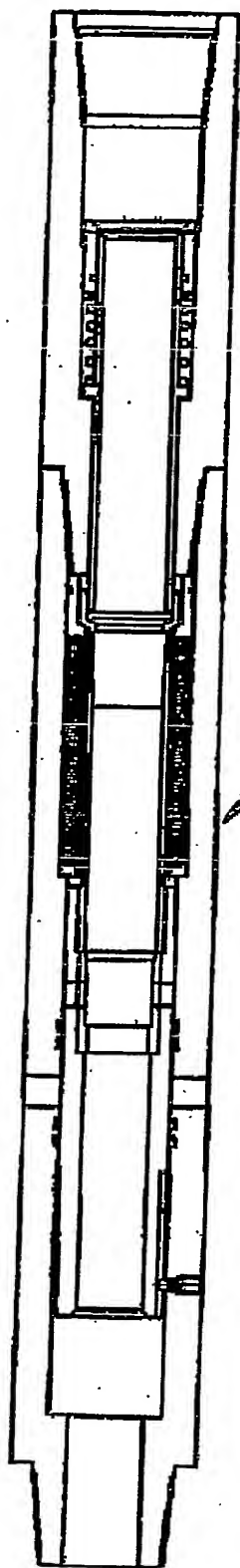
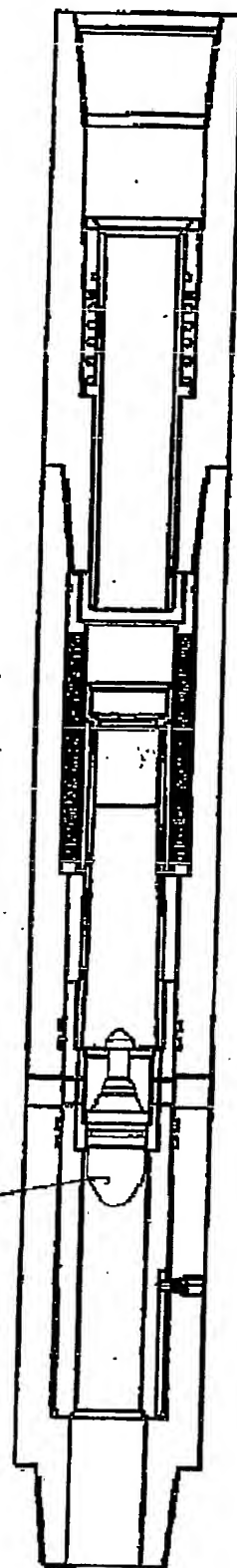


FIG. 1 (Drilling position)

FIG. 2  
(Activated position)



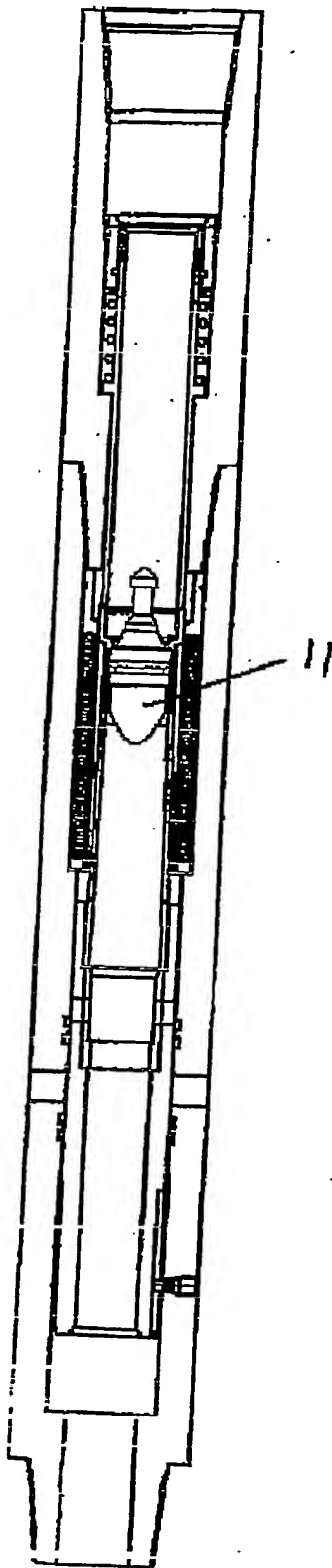


FIG. 3

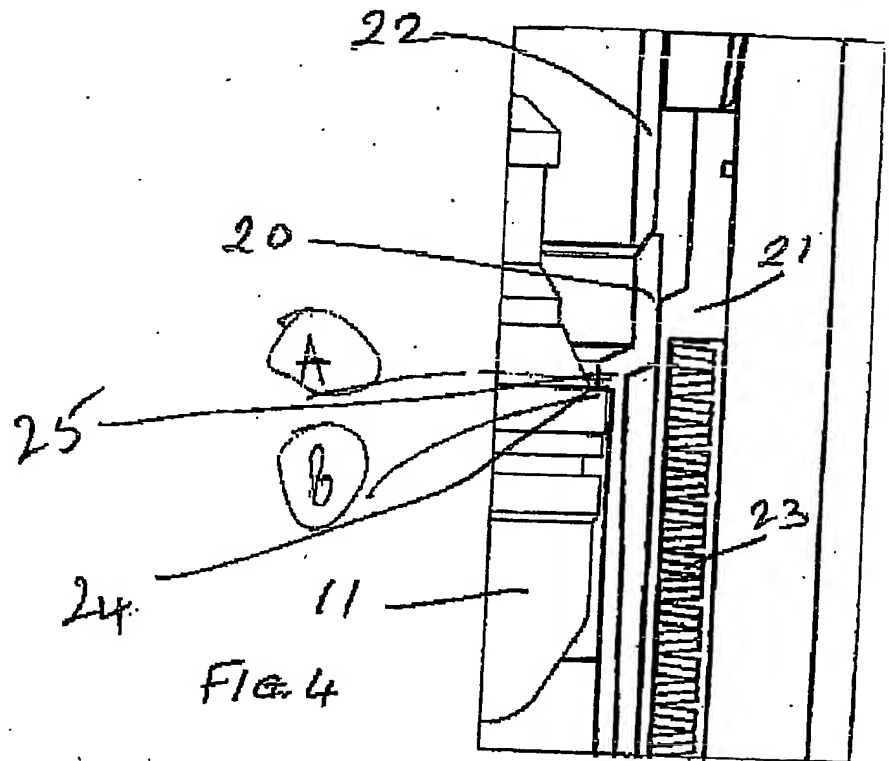


FIG. 4

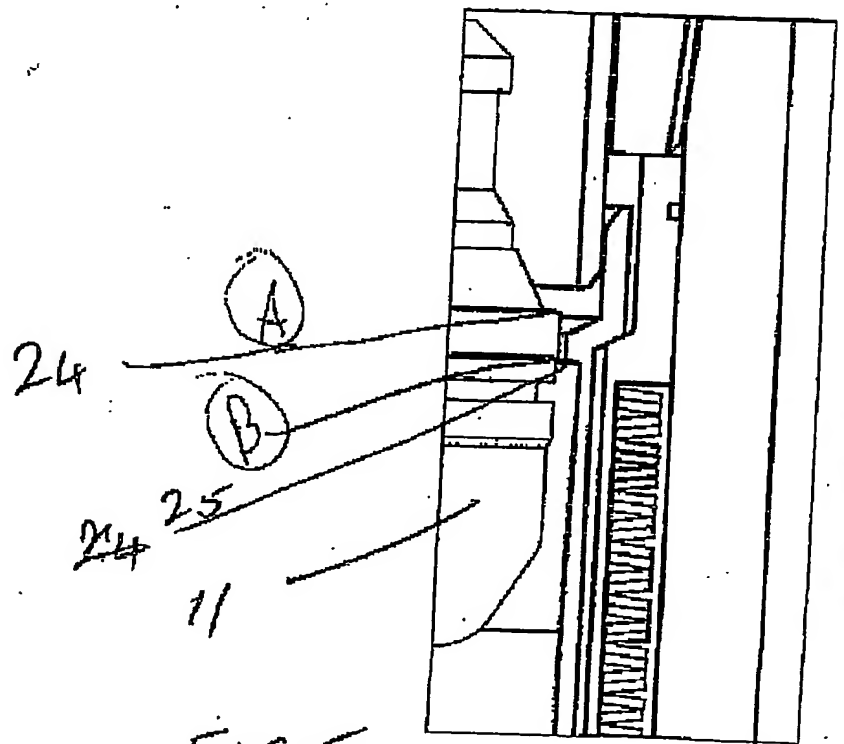


FIG. 5